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Introduction: Effectiveness of Information Technology in Education

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Introduction: Effectiveness of Information Technology in Education

ABSTRACT. This article highlights some of the difficulties that have led to assaults on integrating information technology into the schools. It acknowledges the scarcity of solid evidence to support claims that inserting information technology into education does improve learning. Some currently existing roadblocks to integration are reported. The article, however, points out that positive examples do exist and highlights one of the major research articles in this collection authored by the guest editors, Gerald Knezek and Rhonda Christensen. doi:10.1300/J025v24n03_01 [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <<http://www.HaworthPress.com>> © 2007 by The Haworth Press, Inc. All rights reserved.]

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The literature includes many articles advocating the use of information technology in education. Many authors harbor a belief that information technology, when properly integrated into the school curriculum, can have

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a positive impact on children's learning. There are, however, a number of skeptics who object to the emphasis on integrating technology in education. An example is an opinion expressed on the Alliance for Childhood Web site (Almon & Miller, 2004):

There is an appalling lack of research evidence justifying this massive and costly experiment, particularly if one looks for long-term, cost-effective gains. Just this year, Susan Patrick, head of the Office of Educational Technology at the Education Department, admitted that evidence for the effectiveness of high technology in education was lacking and that "despite a decade of investment, most achievement indicators are flat."

Authors who express such views do have a legitimate point. Claims of success for the use of technology in education abound. There does, however, seem to be a scarcity of scientific articles containing actual data. Many articles claim success but provide little or no statistical evidence. For example, in the February 2007 issue of *T.H.E. Journal*, Matranga describes the successful use of math and science software. While this article may provide valuable information for math and science teachers searching for ideas, it does not offer any scientific evidence and does not go very far in satisfying critics who want to see the numbers.

We can relate to the skepticism expressed by some. We have seen examples where hardware, software, and connectivity have been brought into schools at great expense and much time and trouble with little or no evidence to show that it has improved learning or teaching.

In an article in *Educational Technology* (Johnson & Maddux, 2006), we discussed four conditions that need to be present for full technology integration to occur:

1. Capacity—the hardware, software, and connectivity must be of a sufficient quality.
2. Accessibility—both students and teachers must have sufficient access to technology.
3. Implementation—effective teaching and learning strategies for capitalizing on the technology must be implemented in the classroom.
4. Support—policymakers must encourage and support the wise use of technology. As difficult as it is to satisfy the capacity, accessibility, and implementation aspects of full integration, we have seen examples where even with all other conditions being present, policymakers can stifle integration efforts.

We have seen the frustration of teachers who are in situations where some but not all of these conditions are present. One of the current authors and a colleague who had been involved in training prospective teachers to use technology recently visited the classrooms of 15 of these new teachers. The evidence we gathered was discouraging. All of these new teachers were well trained and excited about using technology in education. Yet all lamented the availability of appropriate technology. They had been educated in the use of technology in teaching, and that education included a variety of enjoyed a variety of modern hardware and software. When some of these new teachers began their first teaching assignment, they were shocked to find that very little modern technology was available to them. However, the most discouraging factor for these new teachers was the lack of support for the use of technology at the district level. While school principals welcomed these new teachers and their technology backgrounds, they were as discouraged as the teachers about this lack of support and about the restrictions placed on teachers by district offices. In a number of schools, district policies prevented teachers from using the technology that was available. The most discouraging example of this was discovered in a school that had received state funds to obtain a fully functioning eMINTS program. The schools had all of the essential elements of the program, including hardware, software, and properly trained personnel. What prevented them from fully implementing this program was district policy. Because of fear of legal action that might result from students' inappropriate use of the Internet, the district had instituted policies that made it virtually impossible for the teachers to use the eMINTS program. This was an alternative high school with smaller-than-average class sizes. With these smaller class sizes, a goal of the school was to individualize instruction. There were 14 networked computers in one classroom, enough to provide one-to-one computer access for the students. The computers were connected to the Internet, and the teacher had access to the entire eMINTS program and had undergone approximately 175 hours of training. In the teachers own words: "I can't do much of what I learned from the eMINTS training and the grant training because of the district's restrictive policies" (personal communication, 2006). The teacher reported that district policy prohibited her from allowing students to use the Web in real time even though it was available. The teacher further reported that, when the students discovered a URL through outside sources such as a book or magazine, they were required to send a written request to the teacher for permission to access that Web site. The teacher then had to send the request to the district office. Only if permission were granted could the student visit the

Web site on a classroom computer. Even though she had adequate technology and a complete curriculum that was in harmony with that technology, she could make very little use of technology in her teaching.

We have discussed such difficulties with Guest Editors Gerald Knezek and Rhonda Christensen. Both agree that research evidence demonstrating the effectiveness of wisely using information technology in the classroom is scarce. However, they expressed a belief that successful technology interventions are occurring. At that time, we discussed the possibility of gathering a collection of data-based research articles to highlight this belief. Gerald and Rhonda did some investigation among their colleagues around the world and determined that they could gather articles that would provide a solid platform for supporting the belief that information technology is making a difference in classrooms here in the United States and in other countries. The articles in this double issue substantiate their belief. While many educators have argued for years that modern technology could make a difference, this volume provides a body of research evidence to support that argument.

Gerald and Rhonda, of course, are correct when they maintain that there are some encouraging studies that demonstrate through solid research evidence that technology can make a difference. For example, there is a growing body of evidence that Maine's Learning Technology Initiative (2007), with its one-to-one laptop computer program, is improving student learning in many ways. The Maine project has demonstrated that

- Teachers are more effectively helping children achieve Maine's state learning standards.
- Students are more motivated to learn, are learning more, and learning it more deeply.
- Students are acquiring 21st-century skills (p. 1).

On another front, some very good evidence is being accumulated by the eMINTS program emanating out of Missouri. While this, like all other efforts to demonstrate the effectiveness of using technology in the classroom, deals with some difficult research issues, it is yielding solid scientific evidence. According to Kleiman's summary of the effectiveness of the program (2004):

While practitioners and policymakers would like quick and simple answers, we need to recognize the dangers of over-simplification.

If we expect all research studies on education innovations to provide a simple “thumbs up or thumbsdown,” we are likely to avoid research methods that can yield important insights into the complexities of implementing major innovations in our schools. (p. 8)

The eMINTS program, which includes strong support for technology-assisted learning, is showing some positive results that are demonstrated with hard research evidence. According to Huntley and Greever-Rice (2007):

The analysis of student MAP scores in the FY04 cohort of eMINTS schools shows significant differences by eMINTS enrollment status on the MAP Communication Arts and Mathematics tests. (p. 1)

As we recently announced, we plan to identify one article in each issue that does an exemplary job of promoting classroom integration of technology. For this issue, that article is authored by Gerald Knezek and Rhonda Christensen. It employs sound research methods on properly using information technology to improve first- and second-graders' reading ability. The researchers measured the results of reading achievement progress between students who were in a technology-enriched reading program and students in a traditional reading program. The technology-enriched reading program included directed instruction for teachers on how to use technology to enhance reading acquisition, and continued instruction and support for the teachers in making use of the technology.

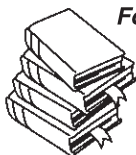
This carefully planned and executed study illustrates that professional development and technology-rich classrooms can have a positive affect on the reading accuracy of first grade students and reading comprehension of second grade students. The bottom line in this study is that when teachers are properly trained and have the proper equipment and necessary support, technology does make a difference.

In summary, while the evidence supporting integrating technology in the classroom has been slow in coming, we suggest that if one looks closely, the evidence is accumulating. In this issue, Gerald Knezek and Rhonda Christensen have compiled articles from educators across America and around the world who report positive results. These articles demonstrate that student learning can be improved where there is adequate technology, administrative support, and a solid curriculum.

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